STATUS OF CLAIMS:

Claims 1-16, 25-28 are pending herein, claims 27 and 28 having been added in response to page 3 of the Office Action mailed June 4, 2003.

REMARKS

Rejection of Claims 1-16, 25 and 26 under 35 U.S.C. 103(a)

Claims 1-4, 6-8 and 10-16 and 26 are rejected under 35 U.S.C. 103(a) as being obvious over Mogi et al. (U.S. Patent No. 4,250,519) in view of Vinson (U.S. Patent No. 4,116,720) and Darwish (U.S. Patent No. 6,569,738 B2).

Claim 5 is rejected under 35 U.S.C. 103(a) as being obvious over Mogi et al. in view of Vinson and Darwish and further in view of Seki (U.S. Patent No. 5,025,293).

Claim 9 is rejected under 35 U.S.C. 103(a) as being obvious over Mogi et al. in view of Vinson and Darwish and further in view of Wolf et al. (ISBN 0-9616721-6-1).

Claim 25 is rejected under 35 U.S.C. 103(a) as being obvious over Mogi et al. in view of Vinson and Darwish and further in view of Baliga (ISBN: 0-89464-799-7) and van Loon et al. (U.S. Patent No. 4,219,835)

The Applicants respectfully traverse these rejections and their supporting remarks.

For example, each of the above claim rejections rely on Darwish (U.S. Patent No. 6,569,738 B2) as a prior art reference. However, because the filing date of the present application (June 14, 2001) is prior to the filing date of Darwish (July 3, 2001) it is not seen how Darwish is prior art to the present invention under the statutory provisions of 35 U.S.C. §102/103.

Moreover, claims 1 and 14, the only independent claims presently under rejection, read as follows:

> 1. (Amended) A trench MOSFET transistor device comprising:
> a drain region of a first conductivity type;
> a body region of a second conductivity type provided over said drain region, said drain region and said body region forming a first junction;
> a source region of said first conductivity type provided over said body region, said source region and said body region forming a second junction;
> source metal disposed on an upper surface of said source region;
> a trench extending through said source region, through said body region and into said drain region; and

a gate region comprising an insulating layer lining at least a portion of said trench and a conductive region within said trench adjacent said insulating layer,

wherein (a) said body region is separated from said source metal, and *(b) a doping profile along a line normal to upper and lower surfaces of said device is such that* ***(i) the doping profile is non-uniform within the body region,*** *and (ii) within said body region and within at least a portion of said source and drain regions, the doping profile on one side of a centerplane of the body region is substantially symmetric with the doping profile on an opposite side of the centerplane.*

14. (Amended) A trench MOSFET transistor device comprising:

a silicon drain region of N-type conductivity;

a silicon body region of P-type conductivity provided over said drain region, said drain region and said body region forming a first junction;

a silicon source region of N-type conductivity provided over said body region, said source region and said body region forming a second junction;

source metal disposed on an upper surface of said source region;

a trench extending through said source region, through said body region and into said drain region; and

a gate region comprising a silicon dioxide layer lining at least a portion of said trench and a doped polycrystalline silicon region within said trench adjacent said silicon dioxide layer,

wherein (a) said body region is separated from said source metal by said source region, (b) said source and drain regions comprise the same doping material, (c) said source and drain regions have peak net doping concentrations that are greater than a peak net doping concentration of said body region, and (d) *a doping profile along a line normal to upper and lower surfaces of said device is such that,* ***(i) the doping profile is non-uniform within the body region,*** *and (ii) within said body region and within at least a portion of said source and drain regions, the doping profile on one side of a centerplane of the body region is substantially symmetric with the doping profile on an opposite side of said centerplane.*

As noted in the applicants' response to the prior Office Action, and in contrast to the presently claimed invention, Vincent does not teach or suggest a symmetric trench MOSFET transistor device in which the body region is non-uniformly doped. Actually, Vincent teaches to the contrary, suggesting that a *uniform* concentration profile is to be used in the body region to achieve symmetrical electrical characteristics. It is also noted that the device of Mogi et al. has a *uniform* body dopant concentration, as it is an epitaxial based device. Therefore, Mogi et al. also teaches away from a non-uniform body doping profile as presently claimed, along with Vincent.

In the Patent Office's Response to Arguments, it is noted that the claims presently distinguish over Mogi et al. and Vinson, but it is further argued that the Darwish "combines well with the teaching by Vinson, as the body region's dopant concentration profile as given by Figure 8A is substantially symmetric and relatively flat in the middle,

while it is understood in the art that any electrical asymmetry necessarily tends to decrease breakdown voltage."

In this regard, it is noted that the doping profile of Figure 8A (which corresponds to the device of Figure 3) clearly illustrates a ***uniformly doped, epitaxial body region*** (i.e., the body region has an essentially flat profile across its width). Hence, like Vincent and Mogi et al. above, Darwish does not teach or suggest a symmetric trench MOSFET transistor device in which the body region is ***non-uniformly*** doped as claimed in claims 1 and 14.

Furthermore, it is unclear what is meant by the statement in the Office Action that "it is understood in the art that any electrical asymmetry necessarily tends to decrease breakdown voltage". Applicants respectfully submit that the opposite is generally true for a given device structure.

For at least the above reasons, it is respectfully submitted that Mogi et al., Vinson, and Darwish, even if combined, do not teach or suggest the invention as presently claimed in claims 1 and 14. Thus, it is respectfully submitted that independent claims 1 and 14 are patentable over Mogi et al., Vinson and Darwish.

None of Seki, Wolf et al., Baliga and van Loon et al. makes up for the above deficiencies in Mogi et al., Vinson and Darwish. Therefore, claims 1 and 14 are patentable over these references as well.

Claims 2-13, 15-16 and 25-28 depend from either claim 1 or claim 14 and are therefore patentable over these references for at least the same reasons as are claims 1 and 14.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the outstanding rejections of 1-16, 25 and 26 under 35 U.S.C. §103(a).

CONCLUSION

Applicants submit that claims 1-16 and 25-28 are presently in condition for allowance, early notification of which is earnestly solicited. Should the Examiner be of the view that an interview would expedite consideration of this Amendment or of the application at large, request is made that the Examiner telephone the Applicant's attorney at (703) 433-0510 in order that any outstanding issues be resolved.

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Respectfully submitted,

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